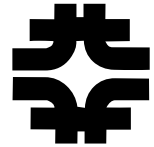


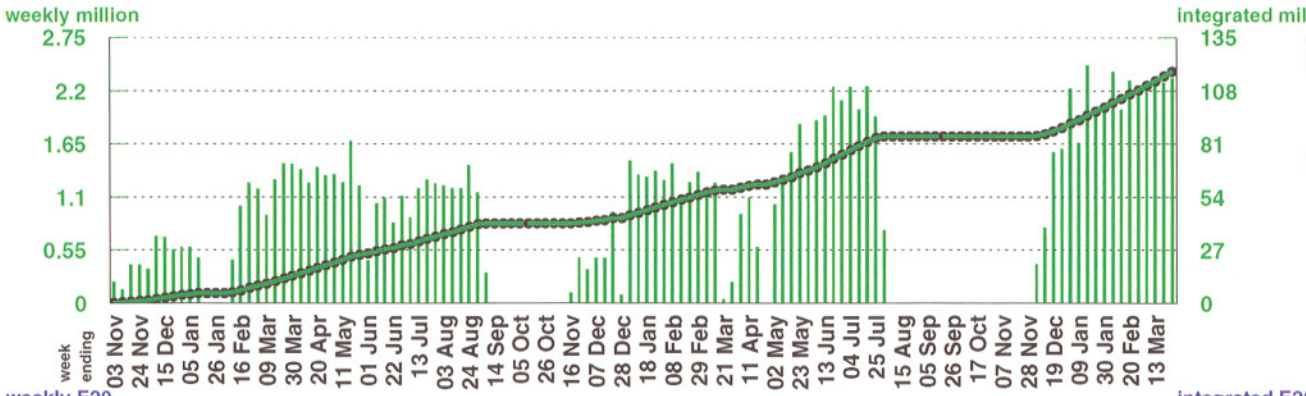
SY120,MB,NUMI

Craig Moore
Fermilab
March 29, 2005

CURRENT STATUS

- SY120
  - Main Injector Particle Production Experiment (MIPP)-data taking
  - MTEST-gearing up for ILC
- MINIBooNE
  - 4.9E20 heading toward 5E20
- NuMI
  - Beam on Target, ramping up for higher intensity/pulse and higher repetition rate
  - Water leak on target, under investigation

Progress Update

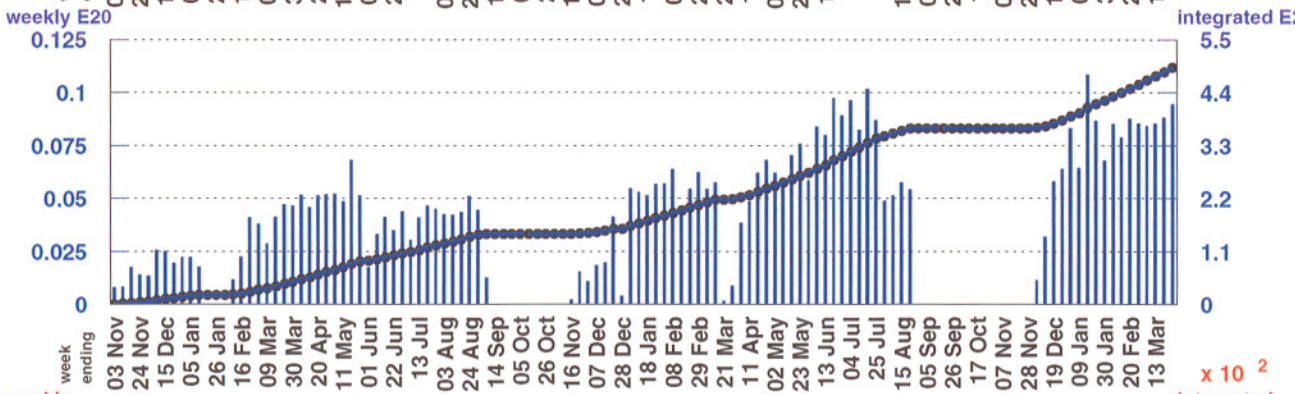


Number of Horn Pulses

To date: 117.65 million

Largest week: 2.46 million

Latest week: 2.32 million

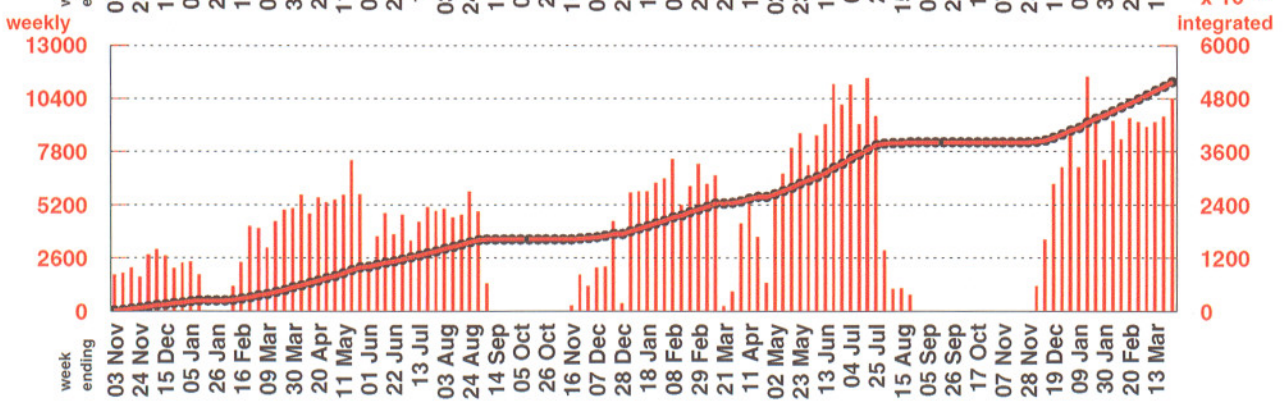


Number of Protons on Target

To date: 4.924 E20

Largest week: 0.1084 E20

Latest week: 0.0945 E20



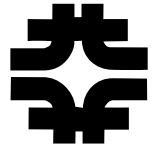
Number of Neutrino Events

To date:517326

Largest week: 11447

Latest week: 10392

Technical Accomplishments



- SY120
  - Resonant extraction from MI
  - 3 Kilometer Beam line (P3 line -see Silver Blaze)
  - Conversion of cryo line to conventional
  - MIPP secondary beam
  - 120 GeV beam to MTest
- MINIBooNE-NUMI
- High Intensity Neutrino Operation
  - Not by chance - ICFA Workshop
  - MiniBooNE test bed for NuMI
  - Beam Permit System and Autotune
  - Well designed beamline with respect to size of beam to relevant apertures

BOOSTER INTEGRATED INTENSITY

YEAR	INTENSITY (1E19 PROTONS)	
1973		
1974	1.48	
1975	1.95	
1976	2.33	
1977	3.00	
1978	2.51	
1979	3.25	
1980	1.36	
1981	2.00	
1982	2.24	
1983	.00307	
1984	.131	
1985	.608	
1986	.152	2.1 E20 ~ MB
1987	1.31	
1988	.737	
1989	.557	
1990	.501	
1991	.725	
1992	1.07	
1993	.971	
1994	1.36	
1995	1.68	
1996	.871	
1997	1.133	3.19 E20

HIGH INTENSITY AND HIGH BRIGHTNESS HADRON BEAMS

20th ICFA International Beam Dynamics Workshop on
High Intensity and High Brightness Hadron Beams
ICFA-HB2002

Batavia, Illinois *8-12 April 2002*

Sponsored by:

Fermilab ICFA KEK

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ICFA WGIII Summary

Craig Moore, Alberto Marchionni

Fermilab

Abstract. A summary of the talks in Working Group III: Beamlines and Targets is presented.

INTRODUCTION

How to handle intense beams safely and how to target them safely were the main foci of this working group. The talks were evenly divided between the two subjects.

HIGH INTENSITY BEAMLINES

Beam transfer lines for the SNS

D. Raparia (BNL)

The SNS talk was concerned with the physics and diagnostic capability of the beamlines into out of the main Ring. The injection line (HEBT) is more than a transfer line with very good diagnostic capability in both longitudinal and transverse dimensions. The line also has the capability of cleaning the beam in both longitudinal and transverse dimensions. The line to the target (RTBT) is note worth for its immunity to kicker failure; for one or even two failures the beam motion on target is minimal.

Sophisticated beam permit system

R. Ducar Fermilab

Radiation protection utilizing electronic berms

John Anderson (Fermilab)

Automatic beam line tuning (AUTOTUNE)

T. Kobilarcik (Fermilab)

At Fermilab the upcoming neutrino experiments will deliver more intensity in a single year than was delivered in the seventeen years of running the Fixed Target Program. In MiniBooNE's case the beam will be almost continuous (18,000 pulses/hour). The intensity and nature of these beams have lead to the development of control mechanisms for the care and handling of these high intensity beams. To begin with a "Sophisticated Beam Permit System" will check a large number of status bits and analogue information before permitting a pulse of beam. Then an automate intensity checking system will determine how much beam was lost from the beginning of the line to the end of the line (electronic berm system). Finally and automated tuning program (Autotune) will find and correct minor beam wandering before there are sufficient losses that the electronic berm system would stop operation.

Tails of beam distribution

A. Marchionni (Fermilab)

B.

The NuMI project is designed to handle an intensity of up to 4×10^{13} protons delivered in 8 μs pulses every 1.9 s, corresponding to a beam power of 0.4 MW.

For the NuMI beam line the normal concern about ground water activation is exacerbated due to the fact that the sloping beamline traverses the aquifer. . Groundwater protection considerations severely constrain the allowable continuous proton losses. Fractional proton losses below 10^{-4} are required in the sloped transport region, with a tighter limit of about 10^{-6} in a limited 140 ft region at the interface between two geological formations. The primary proton beam-line has been carefully designed to take into account these constraints, with input from recent measurements of transverse and longitudinal emittances of the Main Injector beam. A measurement program of beam tails is presently ongoing.

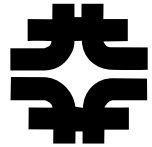
HIGH INTENSITY TARGETS

Mercury target

K. McDonald (Princeton U.)

Neutrino factories demand for targets capable of at least a few MW beam power, optimized for the production of soft pions (50-500 MeV/c). A free mercury jet target located inside a solenoidal magnetic field, with a field adiabatically falling off along the axis to provide focusing of the produced pions, is a promising design for a 4 MW beam power. The goal

Resources Planned



- SY120
  - Phase I only not Phase II - Need to reduce losses in stages until Phase II is installed . Need Phase II for higher intensity experiments (approved Drell-Yan experiment). Also Phase II still included possibility of Proton Area operation.
  - Need upgrade to provide low energy beams for ILC

- MINIBooNE
  - Spare horn and target are being built
  - Air Handling for target box
- NuMI
  - Spare horns/targets to be built

Challenges

- SY120
  - Losses not unexpected for Phase I
  - Request for 1 GeV beams
- MINIBooNE
  - Horn failed - Wonderful job by everyone in horn replacement, low dose picked up, one injury, new horn works
  - The horn had 96 million pulses (84 million with beam), this is an order of magnitude more than any other horn
  - New horns have implemented changes based upon assumed failure mode
- NuMI
  - Possible horn/target failure
  - Replacement rate predicated on 2 year lifetime.

Personnel

- Permanent Physicist Staff
  - Ten at present
  - Three joining from NuMI Department
- Beamline Physicist
  - Three with one leaving soon
- Associate Scientist
  - One - His project is upgrade of MTest

  Visiting Scientist
  - One

ACCELERATOR PROGRAM
16-Mar-05

	FY04	FY05	FY06 PBR	FY07 FLAT	FY08 FLAT	FY09 FLAT
SWF						
Experimental Initiatives & EXT Beams	2,593.5	2,947.0	3,513.0	3,678.0	3,834.3	4,022.3
NuMI/MINOS	2,676.9	3,297.0	2,502.0	2,530.0	2,637.5	2,766.8
SUBTOTAL SWF	**5,270.4**	**6,244.0**	**6,015.0**	**6,208.0**	**6,471.8**	**6789.1**
M&S						
Experimental Initiatives & EXT Beams	632.7	1,174.0	577.0	593.0	610.8	629.1
NuMI/MINOS	860.0	1,149.0	409.0	417.0	429.5	442.4
SUBTOTAL M&S	**1,492.7**	**2,323.0**	**986.0**	**1,010.0**	**1,040.3**	**1,071.5**
SWF + M&S						
Experimental Initiatives & EXT Beams	3,226.1	4,121.0	4,090.0	4,271.0	4,445.1	4,651.4
NuMI/MINOS	3,536.9	4,446.0	2,911.0	2,947.0	3,067.0	3,209.2
TOTAL SWF + M&S	**6,763.1**	**8,576.0**	**7,001.0**	**7,218.0**	**7,512.1**	**7,860.6**